

## **ABSTRACT**

Disclosed are resonant gas sensors and methods for forming and using the disclosed sensors. The sensors include a resonator including a layer comprising adsorptive nanostructures, for example carbon nanotubes, activated carbon fibers, or adsorptive nanowires. The dielectric of the resonator is in electrical communication with the layer comprising adsorptive nanostructures such that the effective resonant frequency of the resonator depends on both the dielectric constant of the dielectric as well as the dielectric constant of the adsorptive layer. In some embodiments, the nanostructures can be degassed. The sensors can detect the presence of polar gases, non-polar gases, organic vapors, and mixtures of materials with both high sensitivity and high selectivity.